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【DESCRIPTION】

【Invention Title】

SELF-CLOSING APPARATUS FOR A SLIDE AND SLIDE HAVING THIS

【Technical Field】

The present invention relates to a self-closing apparatus for a slide and a slide having this, and more particularly to a self-closing apparatus for a slide, which automatically moves a drawer to a completely closed position by means of elastic force of springs when the drawer moves toward the closed position, and a slide having the self-closing apparatus.

【Background Art】

In general, slides are mounted to an item, for example, a cabinet, in which a drawer is received, in such a manner that a pair of slides are symmetrically mounted to opposite side walls of the cabinet defining a space for receiving the drawer, in order to slidably move the drawer between a closed position and an open position. Such slides are mainly used in drawers of tables, clothes chests, and dressers, and may be used in any item, such as a Kimchi refrigerator, including a drawer or drawers slidable between a closed position and an open position with respect to the body of item.

Conventional slides have a problem in that force must be continuously applied to the drawer until the drawer is completely closed. Also, there is inconvenience in that, when the drawer is closed with excessive force, the drawer

may slam against the cabinet, so that the drawer may be unintentionally re-opened due to the resultant repulsive force. In order to solve these problems, a proposal has been made in which the slides are mounted such that they are slightly downwardly inclined as they extend inwardly in the cabinet, thereby causing the drawer to be self-closed without being unintentionally opened. In this case, however, the drawer may slam against the cabinet due to the weights of the drawer and articles received in the drawer, thereby generating high impact force. As a result, the cabinet, the drawer, and rails of the slides supporting the drawer may be damaged.

In order to solve the above problem, the present applicant proposed an improved structure which is disclosed in Korean Utility Model Registration No. 20-0287996 entitled "SLIDER FIXING AND GUIDING APPARATUS FOR DRAWER". However, this apparatus, which employs a single hooked spring, has a problem in that the apparatus cannot be used for a prolonged period of time when it is used at the drawer for receiving heavy articles because the hooked portions of the spring may be easily broken.

PCT Publication No. WO 2001-82749 discloses a mechanism for a self-closing slide which includes a guide pin, a spring, an actuator, and a housing. The spring and actuator of the mechanism are coupled to the guide pin such that the spring urges the actuator toward a rear wall of the housing. The spring is in a compressed state at an open position of the slide, and is in a normal state at a closed position of the slide. The spring is not stretched, and is thus not broken.

The housing of the above mechanism includes rear, front, upper and two opposite side walls, and has a structure for receiving all of the guide pin, spring, and actuator. That is, the housing has a box-shaped structure within which the guide pin, spring, and actuator are placed. However, such a box-shaped housing cannot be easily manufactured, and requires high production costs. In order to fix the housing to a fixed member (an outer member) of the slide, a plurality of legs are formed integrally with the housing. For this reason, there are problems of a more complex manufacturing process and an increase in manufacturing costs.

【Disclosure of Invention】

Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a self-closing apparatus for a slide, which automatically moves a drawer to a completely closed position by tensile force of springs and prevents the spring from being early broken and has a simple structure.

In accordance with the present invention, the above and other objects can be accomplished by the provision of a self-closing apparatus comprising: a pair of springs; a moving pin; a moving pin guide; a plate-shaped movable member; and a plate-shaped fixed member.

The moving pin comprises a support pin portion having a cylindrical shape, a support plate, and a guide protrusion. The moving pin guide comprises a moving pin guide slot and first coupling means. The moving pin guide slot is formed by a pin-receiving inlet portion defined by two inlet surfaces and a pin engaging portion defined by three engaging surfaces. The movable member comprises a plate portion centrally provided with a hole, sliding rods formed integrally with the plate portion, and spring support portions to which first ends of the springs are respectively coupled. The fixed member may comprises a support base comprising spring support portions, to which second ends of the springs are respectively coupled, an extension bar comprising movable member sliding portions formed at opposite longitudinal sides of the extension bar, and a moving pin guide portion formed at an intermediate portion of the extension bar, a head, and second coupling means.

Each sliding rod of the movable member comprises a protrusion and a sliding groove. The moving pin guide portion of the fixed member comprises a rectilinear guide portion and a curved guide portion. The moving pin guide may be fixed to a movable rail of the slide by the first coupling means such that the moving pin guide is moved together with the movable rail. The fixed member is fixed to a fixed rail of the slide by the second coupling means.

The moving pin is slidably coupled to the moving pin guide portion of the fixed member. The movable member sliding portions of the fixed member is slidably engaged with the sliding grooves of the movable member under a condition in which the support pin portion of the moving pin is inserted in the hole of the movable member, so that the moving pin moves integrally with the movable member along the moving pin guide portion of the fixed member when the movable member slides along the movable member sliding portions of the fixed member.

In accordance with the present invention, when the slide is in an extended state, the moving pin of the self-closing apparatus is located at the curved guide portion of the moving pin guide portion of the fixed member. When the slide is in a retracted state, the moving pin is located at an inner end of the rectilinear guide portion of the moving pin guide portion. When the moving pin moves from the location corresponding to the extended state of the slide to the location corresponding to the retraced state of the slide, this movement is automatically carried out by tensile force of the springs. Thus, the self-closing apparatus automatically closes the slide. The self-closing apparatus of the present invention prevents early breakage of springs, has a simple structure and low production costs, and is easily returned from an abnormal operating state to a normal operating state.

Preferably, an engagement groove is formed at one of three engaging surfaces of the pin engaging portion.

Further preferably, tapered portions are formed at a portion near the ends of the spring.

Further preferably, the extension bar of the fixed member comprises protrusions being parallel with the movable member sliding portions while being close to the movable member sliding portions.

Further preferably, a movable rail support is formed on a surface of the movable member to support and guide the movable rail.

【Description of Drawings】

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a cross sectional view of a three-member slide;

FIG. 2 is a perspective view of a three-member slide having a self-closing apparatus in accordance with the present invention;

FIG. 3 is a perspective view of the self-closing apparatus in accordance with the present invention;

FIG. 4 is a perspective view of a moving pin;

FIGS. 5A to 5C are a perspective, rear, and front views respectively of a moving pin guide;

FIGS. 6A and 6B are a perspective and front views respectively of an embodiment of a movable member;

FIG. 6C is a sectional view of the movable member seen from the direction of "B" of FIG. 6A;

FIGS. 7A and 7B are a front and rear view respectively of a fixed member;

FIG. 8 is a partial sectional view taken along the line A-A of FIG. 7A;

FIG. 9 is a perspective view illustrating a state in which only the moving pin is engaged with the fixed member;

FIGS. 10A and 10B are front views respectively illustrating a state in which the moving pin is located at one end of a rectilinear guide portion of a moving pin guide portion of the fixed member, and a state in which the moving pin is located at a curved guide portion of the moving pin guide portion of the fixed member;

FIG. 11 is a schematic view illustrating a state in which the moving pin is separated from the moving pin guide;

FIG. 12 is a schematic view illustrating a state in which the moving pin guide is coupled to the moving pin located at the curved guide portion;

FIG. 13 is a schematic view illustrating a state in which the moving pin

guide is coupled to the moving pin and is located at a completely retracted position of the slide by the force of springs;

FIG. 14A is a perspective view of an alternate embodiment movable member;

FIG. 14B is a sectional view of the movable member seen from the direction of "B" of FIG. 14A; and

FIG. 15 is a schematic view illustrating an abnormal state of the self-closing apparatus of the present invention.

【Best Mode for Carrying Out the Invention】

Generally, slides may be two-member slides (including a fixed rail and a movable rail) or three-member slides (including a fixed rail and two movable rails). Referring to FIG. 1, a three-member slide 10 is illustrated. The three-member slide comprises a fixed rail (outer member) 800 and two movable rails, i.e., an intermediate movable rail (intermediate member) 900 sliding within the fixed rail 800 and an inner movable rail (inner member) 700 sliding within the intermediate movable rail 900 (FIGS. 1 and 2). Ball retainers 950 having proper lengths are positioned between adjacent rails. Balls 955 are retained by the ball retainers 950, respectively, thereby allowing the movable rails 700 and 900 to smoothly slide.

The slide 10, as shown in FIG. 2, is used to slidably move a drawer 960 between a closed position and an open position in a cabinet (not shown). The fixed rail 800 of the slide10 is attached to a proper position of the cabinet and drawer 960 is coupled to the inner movable rail 700 by fastening means such as screws fastened through coupling holes 720. Accordingly, movement of the drawer 960 causes sliding of the inner movable rail 700 and/or the intermediate movable rail 900. At a completely closed position of the drawer 960, the slide 10 is in a completely retracted state (a completely retracted state of the movable rails). At a completely open state of the drawer 960, the slide 10 is in a completely extended state (a completely extended state of the movable rails).

A self-closing apparatus 20 for a slide in accordance with the present invention is mounted to the rearmost end of the fixed rail 800. A rail groove 910 is formed at the rearmost end of the intermediate movable rail 900 to receive a part of the self-closing apparatus 20.

FIG. 3 is a perspective view of the self-closing apparatus 20 in accordance with a preferred embodiment of the present invention. The self-closing apparatus 20 comprises a moving pin 400, a movable member 200, a fixed member 100, and a pair of springs 500. The self-closing apparatus 20 further comprises a moving pin guide 300 (FIG. 11) coupled to the inside of the inner movable rail 700 and separably engaged with the moving pin 400.

Referring to FIG. 4, the moving pin 400 includes a guide protrusion 410 formed at one end of the moving pin 400, a support pin portion 430 formed at the other end of the moving pin 400, and a support plate 420 formed between the guide protrusion 410 and the support pin portion 430. The moving pin 400 also includes a groove 411 formed between the guide protrusion 410 and the support plate 420. The support pin portion 430 of the moving pin 400 has a cylindrical shape.

FIGS. 5A to 5C are a perspective, rear, and front views respectively of the moving pin guide 300. A moving pin guide slot 350 is formed at the moving pin guide 300 (FIG. 5A), and includes a pin-receiving inlet portion 310 and a pin engaging portion 320 (FIG. 5B). The pin-receiving inlet portion 310 includes a first inlet surface 311 and a second inlet surface 312, whereas the pin engaging portion 320 includes a first rectilinear engaging surface 323, a second rectilinear engaging surface 324, and a curved engaging surface 325. Preferably, an engagement groove 328, with which the moving pin 400 is engagable, is formed at the second rectilinear engaging surface 324 of the pin engaging portion 320. The detailed function of the moving pin guide slot 350 will be described later.

The moving pin guide 300 includes first coupling means for coupling the moving pin guide 300 to the inner movable rail 700 (FIG. 11) of the slide 10. FIGS. 5A to 5C illustrate a hole 330, serving as the first coupling means, in which a coupling protrusion 710 of the inner movable rail 700 is fitted.

Preferably, elastic blocks 340 are respectively formed at opposite longitudinal sides of the moving pin guide 300. The elastic blocks 340 are slightly diverged from each other in a state of being outwardly protruded from the associated longitudinal sides of the moving pin guide 300, respectively, as they extend rearward. A buffering groove 341 is formed around each elastic block 340. Since the elastic blocks 340 are diverged from each other in a state of outwardly protruded from the associated longitudinal sides of the moving pin guide 300, FIG. 5B, illustrating the rear surface of the moving pin guide 300 (here, the rear surface refers to the surface of the moving pin guide 300 coupled to the inner movable rail 700 of the slide 10), shows that the elastic blocks 340 are protruded from the longitudinal side surfaces of the moving pin guide 300. But, FIG. 5C, illustrating the front surface of the moving pin guide 300, shows that the opposite longitudinal edges of the moving pin guide 300 are rectilinear. When the moving pin guide 300 is inserted into the inner movable rail 700 of the slide 10, the elastic blocks 340 is elastically deformed to allow an easy insertion of the moving pin guide 300 (since the self-closing apparatus of the present invention including the moving pin guide 300 is made of a proper plastic material, the elastic blocks 340 have an elasticity). Once the moving pin guide 300 is inserted into the inner movable rail 700, the elastic blocks 340 serve to prevent the moving pin guide 300 from being separated from the inner movable rail 700 of the slide 10. Thus, the moving pin guide 300 is easily inserted into the inner movable rail 700 and firmly fixed to the inner movable rail 700 by the first coupling means and the elastic blocks 340.

FIGS. 6A and 6B are a perspective and front views respectively of the movable member 200, and FIG. 6C is a sectional view of the movable member 200 seen from the direction of "B" of FIG. 6A. The movable member 200 includes a substantially rectangular plate portion 210, sliding rods 220 formed integrally with the plate portion 210, and spring support portions 212 respectively formed at opposite longitudinal sides of the plate portion 210.

Each sliding rod 220 includes a protrusion 221 and a U-shaped sliding groove 222. Movable member sliding portions 121 of the fixed member 100,

which will be described later, are respectively engaged in the sliding grooves 222 of the sliding rod 220.

The spring support portions 212 are formed at an end of the plate portion 210 opposite to an engaging surface 223. In the present invention, any linear spring may be used as the springs. That is, any linear spring, both end portions of which have a hooked or tapered shape, may be used. Preferably, tapered linear springs which have the tapered portions respectively formed at a portion near the end of the spring are used. The tapered spring 500 (FIGS. 10A and 10B) can be used for a prolonged period of time without breakage even when a heavy load of the drawer is applied to the slide, as compared to the hooked linear spring. According to a test performed by the present applicant, the hooked portions of the hooked spring was broken when the hooked spring was repeatedly used approximately 5,000 times, but the tapered spring having the same strength as that of the hooked spring had a life span as long as 5 times the hooked rectilinear spring under the same drawer load. Referring to FIG. 6A, one end of each tapered spring 500 is received in an associated one of the spring support portions 212.

A hole 211 is centrally formed through the plate portion 210. The support pin portion 430 of the moving pin 400 shown in FIG. 4 is inserted into the hole 211 from the direction of the sliding grooves 222. Preferably, the hole 211 has a length corresponding to a transversal length C (Fig.7A) of a moving pin guide portion 123 formed at the fixed member 100 so that the support pin portion 430 received in the hole 211 can move transversely. Further, preferably, a buffering portion 213 for absorbing impact, which is applied to the movable member 200 when the movable member 200 collides with another member, is formed on one end of the plate portion 210.

FIGS. 7A and 7B are a front and rear view respectively of the fixed member 100. Here, the rear surface of the fixed member 100 refers to the surface of the fixed member 100 coupled to the fixed rail 800 (FIG. 11) of the slide. The fixed member 100 includes a support base 110, an extension bar 120 formed integrally with the support base 110, and a head 130 formed integrally with the

extension bar 120. The entire structure of the fixed member 100 has a plate shape.

Stoppers 119 are formed where the support base 110 meets the extension bars 120 at the side of the support base 110 connected to the extension bars 120. Spring support portions 111 are formed both sides of the support base 110. Each spring support portion 111 receives the other end of an associated one of the springs 500. The spring support portions 111 have a structure corresponding to that of the spring support portions 212 of FIG. 6A.

The moving pin guide portion 123 is longitudinally formed in the extension bar 120. The moving pin guide portion 123 includes a rectilinear guide portion 124 and a curved guide portion 125. The moving pin 400 is inserted into the moving pin guide portion 123 to slide along the moving pin guide portion 123. Movable member sliding portions 121, which are inserted into respective sliding grooves 222 of the movable member 200, are formed at opposite sides of the extension bar 120. As shown in FIG. 8 illustrating the cross section of the movable member 200 taken along the line A-A of FIG. 7A, protrusions 122 are formed on the extension bar 120 to extend parallel with the movable member sliding portions 121 while being close to the movable member sliding portions 121. The protrusions 122 serve as supporters for preventing the movable member 200 from being bent or twisted even when transversal or longitudinal compressing force is applied to the movable member 200. A buffering space 126 is formed at one end of the rectilinear guide portion 124 of the moving pin guide portion 123 of the extension bar 120. The buffering space 126 is connected to the moving pin guide portion 123, and extends parallel with the moving pin guide portion 123. A support protrusion 127 is formed between the moving pin guide portion 123 and the buffering space 126. Preferably, a twist preventing protrusion 128 for preventing the support protrusion 127 from twisting is formed at the support protrusion 127 on the rear surface of the fixed member 100. The functions of the buffering space 126 and twist preventing protrusion 128 will be described later.

Preferably, an impact buffering portion 132 is formed at the head 130 of the fixed member 100. When the fixed member 100 collides with another

member of the slide (for example, the intermediate movable rail of the three-member slide), the impact buffering portion 132 serves to absorb impact. The above collision may be generated when the rail reaches a retracted position.

Second coupling means for coupling the fixed member 100 to the fixed rail 800 of the slide is provided at the support base 110 and head 130 of the fixed member 100. In the illustrated case, the second coupling means comprises coupling holes 112 and 131 for riveting.

Hereinafter, the connection and function of the above members will be described.

First, the moving pin 400 is engaged in the moving pin guide portion 123 of the fixed member 100. FIG. 9 is a perspective view illustrating a state in which only the moving pin 400 is engaged with the fixed member 100. This engagement is achieved by inserting the moving pin 400 into the moving pin guide portion 123 such that the groove portion 411 of the moving pin 400 formed between the guide protrusion 410 and the support plate 420 is engaged with the moving pin guide portion 123 of the fixed member 100 under the condition in which the guide protrusion 410 is directed to the rear surface of the fixed member 100, and the support pin portion 430 is directed to the front surface of the fixed member 100. Here, the above insertion is easily achieved by simply pushing the guide protrusion 410 of the moving pin 400 to pass through the moving pin guide portion 123 while pushing the support protrusion 127 toward the buffering space 126 of the fixed member 100. After the moving pin 400 is engaged in the moving pin guide portion 123, the movable member 200 is coupled to the fixed member 100. Coupling is achieved by inserting the support pin portion 430 of the moving pin 400 into the hole 211 of the movable member 200, and inserting the movable member sliding portions 121 of the fixed member 100 into the sliding grooves 222 of the movable member 200. Finally, one end of each spring 500 is coupled to an associated one of the spring support portions 111 of the fixed member 100, and the other end of each spring 500 is coupled to an associated one of the spring support portions 212 of the movable member 200. FIG. 3 is a perspective view illustrating the self-closing apparatus completely assembled in

the above-described manner. In the assembled state, the movable member 200 is slidable along the movable member sliding portions 121 of the fixed member 100. When the movable member 200 slides, the moving pin 400 is moved along the moving pin guide portion 123 of the fixed member 100 because the moving pin 400 is moving together with the movable member 200.

FIGS. 10A and 10B are front views illustrating a coupled state of the fixed member 100, movable member 200, moving pin 400, and springs 500. FIG. 10A illustrates a state in which the moving pin 400 is positioned at one end of the rectilinear guide portion 124 of the moving pin guide portion 123 of the fixed member 100, and FIG. 10B illustrates a state in which the moving pin 400 is positioned at the curved guide portion 125 of the moving pin guide portion 123 of the fixed member 100. The moving pin 400 moves between the above two positions. When the moving pin 400 is positioned at the curved guide portion 125, the springs 500 are maximally stretched.

As described above, the fixed member 100, to which the moving pin 400, movable member 200, and springs 500 are coupled, is coupled to the fixed rail 800 of the slide by the second coupling means, and the moving pin guide 300 is coupled to the inner movable rail 700 of the slide by the first coupling means.

Now, the function of the self-closing apparatus of the present invention will be described with reference to FIGS. 11 to 13.

In FIGS. 11 to 13, the slide is a three-member slide including two movable rails (an intermediate movable rail and an inner movable rail) and one fixed rail. However, for simplification, the intermediate movable rail positioned between the inner movable rail 700 and the fixed rail 800 will be omitted. Also, for convenience, the drawer and the walls of the cabinet will be omitted, and only the slide will be described. Further, since the fixed member 100 is fixed to the fixed rail 800, and the moving pin guide 300 is fixed to the inside of the inner movable rail 700 such that the moving pin guide 300 faces the fixed member 100, the moving pin guide 300 is not shown, but, for convenience, is shown by a solid line.

FIG. 11 is a schematic view illustrating a state in which the fixed member

100 is separated from the moving pin guide 300 under the condition that the fixed member 100 is riveted to the fixed rail 800 of the slide, and the moving pin guide 300 is coupled to the coupling protrusion 710 of the inner movable rail 700 of the slide. When the drawer is pushed from an open position toward a closed position, the inner movable rail 700 of the slide moves from an extended position toward a retracted position. In this case, the moving pin 400, which is inserted in the hole 211 of the movable member 200 to move integrally with the movable member 200, is in a state of being positioned at the curved guide portion 125 of the moving pin guide portion 123 of the fixed member 100. Also, the springs 500 are in a maximally stretched state.

FIG. 12 is a schematic view illustrating a state in which the moving pin guide 300 is coupled to the moving pin 400, particularly to the support pin portion 430,positioned at the curved guide portion 125 when the inner movable rail 700 further moves toward the retracted position. In this case, the support pin portion 430 of the moving pin 400 is inserted into the pin-receiving inlet portion 310 defined by the first inlet surface 311 and second inlet surface 312, and is then moved along the first rectilinear engaging surface 323 and second rectilinear engaging surface 324 of the pin engaging portion 320. This movement separates the moving pin 400 from the curved guide portion 125. As soon as the moving pin 400 is separated from the curved guide portion 125, the movable member 200 and the moving pin 400 moving integrally with the movable member 200 are moved along the rectilinear guide portion 124 by the tensile force of the springs 500. Then, the movable member 200 and moving pin 400 move to a completely retracted position along the rectilinear guide portion 124 of the fixed member 100 until the engaging surface 223 (FIG. 6A) of the movable member 200 is engaged with the stoppers 119 of the fixed member 100,thereby causing the inner movable rail 700 of the slide to automatically move to the completely retracted position.

According to the present invention, as described above, the engagement groove 328 is formed at the second rectilinear engaging surface 324. The engagement groove 328 is formed at a position, at which the support pin portion 430 of the moving pin 400 is engaged with the engagement groove 328 just when

the moving pin 400 is separated from the curved guide portion 125. Accordingly, as soon as the moving pin 400 is separated from the curved guide portion 125, the support pin portion 430 of the moving pin 400 is safely engaged with the engagement groove 328, and is moved along the rectilinear guide portion 124.

FIG. 13 is a schematic view illustrating a state in which the moving pin guide 300 and the support pin portion 430 of the moving pin 400 have been moved to the completely retracted position of the slide (that is, the completely closed state of the drawer) by the force of springs 500.

The extension of the slide is performed in the reverse order of the above process. When the inner movable member 700 of the slide is extended (that is, the drawer is extended), the moving pin 400, which has been in the state of FIG. 13, is moved along the rectilinear guide portion 124 under the condition that the support pin portion 430 of the moving pin 400 is engaged with the engagement groove 328. When the moving pin 400 reaches the curved guide portion 125, the support pin portion 430 of the moving pin 400 is separated from the engagement groove 328, and is then moved along the second rectilinear engaging surface 324 toward the pin-receiving inlet portion 310. When the support pin portion 430 moves along the second rectilinear engaging surface 324, and reaches the pin-receiving inlet portion 310, the moving pin 400 is engaged with the curved guide portion 125 of the moving pin guide portion 123 of the fixed member 100 (the state shown in FIG. 12). Further movement of the moving pin 400 toward the extended position separates the moving pin 400 from the pin-receiving inlet portion 310 of the moving pin guide 300, so that the moving pin 400 is separated from the moving pin guide 300. The state, in which the moving pin guide 300 moves toward the extended position after being separated from the moving pin 400, corresponds to the state of FIG. 11.

When the inner movable rail 700 of the slide is located at the extended position as described above, the moving pin 400 is positioned at the curved guide portion 125 of the fixed member 100. When the inner movable rail 700 is moved to the retracted position, the pin engaging portion 320 of the moving pin guide 300 coupled to the inner movable rail 700 is coupled to the support pin portion 430 of

the moving pin 400, and is then pulled by the tensile force of the springs 500 to move along the rectilinear guide portion 124 of the fixed member 100. The movement of the pin engaging portion 320 along the rectilinear guide portion 124 of the fixed member 100 is continued until the engaging surface 223 of the movable member 200 is engaged with the stoppers 119 of the fixed member 100. Thus, the drawer is automatically moved to the completely closed position.

As described above, the movable rails 700 and 900 are extended or retracted in a state of being operatively connected by the ball retainers 950. However, since the movable rails 700 and 900 are supported by the ball retainers 950 only, the front ends of the movable rails 700 and 900 may be rocked during the extension or retraction of the movable rains 700 and 900. Such vibration of the movable rails 700 and 900 causes a difficulty in coupling the moving pin guide 300 to the moving pin 400 when the state of FIG. 11 is changed to the state of FIG. 12. That is, the vibration of the movable rails 700 and 900 disturbs smooth operation of the self-closing apparatus.

FIG. 14A is a perspective view of an alternate embodiment movable member 200' which is provided with a movable rail support 270 for preventing the front end of the inner movable rail 700 from vibrating. FIG. 14B is a sectional view of the movable member 200' seen from the direction of "B" of FIG. 14A.

As shown in FIGS. 14A and 14B, the movable rail support 270 is formed on a surface of the movable member 200' opposite to the surface of the movable member 200' in which the U-shaped sliding grooves 222 are formed. The movable rail support 270 includes support bars 272 formed integrally with the movable member 200'. Preferably, the support bars 272 have a rectangular shape. Of course, the support bars 272 may have a triangular shape. The support bars 272 are vertically spaced apart from each other by a distance corresponding to the width of the inner movable rail 700. The support bars 272 have a length suitable to guide the inner movable rail 700. Preferably, the support bars 272 extend throughout the overall length of the movable member 200'. The support bars 272 serve to restrain lateral vibration of the inner movable rail 700. Other portions of the movable member 200' are the same as those of the

movable member 200.

Preferably, support flanges 274 are respectively formed at free ends of the support bars 272. The support flanges 274 serve to restrain vertical vibration of the inner movable rail 700. To this end, the protruded height of each bar 272 from the movable member 200' corresponds to the height of the inner movable rail 700.

When the moving pin guide 300 moves toward the retracted position, the moving pin 400 is not in the state of being engaged with the curved guide portion 125 (the state of FIG. 11), but may be located at the completely retracted position, i.e., at the position in which the moving pin guide 300 completes the movement along the rectilinear guide portion 124 (the state of FIG. 13). This state occurs in the case that a certain element enters the slide due to user's careless mistake when the slide is located at the extended position, thereby separating the moving pin 400 from the curved guide portion 125. Even in such an abnormal operating state, the self-closing apparatus of the present invention is easily returned to its normal operating position.

When the moving pin guide 300 moves toward the retracted position in the above state, that is, the abnormal operating state in which the moving pin 400 completes the movement along the rectilinear guide portion 124, as shown in FIG. 15, the moving pin guide 300 is moved toward the retracted position by the force applied by the user to push the drawer to the closed position, and the second inlet surface 312 of the moving pin guide 300 meets the support pin portion 430 of the moving pin 400. Since the second inlet surface 312 is inclined at an angle of approximately 45 degrees, further movement of the moving pin guide 300 toward the retracted position cause to push the support pin portion 430 of the moving pin 400 into the buffering space 126 of the fixed member 100. This pushing moves the free end of the support protrusion 127 into the buffering space 126. As a result, the moving pin 400 moves towards the pin engaging portion 320 after passing the second inlet surface 312 of the moving pin guide 300. Consequently, the moving pin 400 enters the pin engaging portion 320 through the pin-receiving inlet portion 310 of the moving pin guide 300. When the moving pin 400 enters the pin

engaging portion 320 of the moving pin guide 300, the self-closing apparatus of the present invention is returned to the original normal operating position (the state of FIG. 13).

Preferably, as described above, the twist preventing protrusion 128 for preventing the support protrusion 127 from twisting is formed at the support protrusion 127 on the rear surface of the fixed member 100 (FIG. 7B). The twist preventing protrusion 128 serves to linearly move the support protrusion 127 to the buffering space 126 without twisting, when the self-closing apparatus of the present invention is returned from the abnormal operating state to the normal operating state, i.e., when the further movement of the moving pin guide 300 toward the retracted position cause to push the support pin portion 430 of the moving pin 400 into the buffering space 126 of the fixed member to move the free end of the support protrusion 127 into the buffering space 126. When the support protrusion 127 is severely twisted, the moving pin 400 may be separated from the rectilinear guide portion 124 of the moving pin guide portion 123 of the fixed member 100, and may enter the buffering space 126. In this case, the self-closing apparatus cannot operate normally until the slide is disassembled and assembled to be returned to its normal position. When twisting force is applied to the support protrusion 127, the twist preventing protrusion 128 comes into contact with the inner surface of the fixed rail 800 of the slide, and gives repulsive force, thereby preventing the support protrusion 127 from twisting.

As described above, although the preferred embodiment of the present invention describes one slide, those skilled in the art will appreciate that two slides must be symmetrically installed. Since two slides must be symmetrically installed, two self-closing apparatuses of the present invention must also be manufactured to have symmetrical structures, respectively, such that a pair of the fixed members 100 and a pair of the moving pin guides 300 are manufactured to have symmetrical structures like a mirror image respectively.

Further, although the preferred embodiment of the present invention describes a self-closing apparatus applied to a three-member slide including two movable rails and one fixed rail, those skilled in the art will appreciate that the

self-closing apparatus of the present invention may be applied to a two-member slide including one movable rail and one fixed rail.

Preferably, the self-closing apparatus of the present invention is made of a plastic material having proper strength and elasticity, but is not limited thereto.

Further, although the moving pin guide of the self-closing apparatus of the present invention is separately manufactured, and is mounted to the end of the movable rail in the illustrated case, the moving pin guide may be formed at the end of the movable rail by means of punching.

【Industrial Applicability】

As apparent from the above description, the present invention provides a self-closing apparatus for a slide, which automatically closes a drawer without continuously applying force to the drawer until the drawer is completely closed, and prevents the drawer from being re-opened by repulsive force caused by impact generated when the drawer is slammed, thereby being conveniently used.

The self-closing apparatus of the present invention prevents early breakage of springs, has a simple structure and low production costs, and is easily returned from an abnormal operating state to a normal operating state.

The self-closing apparatus of the present invention restrains vibration of the front ends of the movable rails, thereby being smoothly operated.

Although the preferred embodiment of the present invention has been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.